

Amendments to the Specification:

Please replace paragraph [0011] as follows:

[0011] In order to simulate a well test, whatever the medium, this equation has to be solved in space and in time. Defining-Discretization of the reservoir (mesh pattern) is therefore performed and solution of the problem ~~finds-consists in finding~~ the pressures of the meshes with time, itself defined -discretized in a certain number of time intervals.

Please replace paragraph [0019] as follows:

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] Other features and advantages of the method according to the invention will be clear from reading the description hereafter of a non limitative realisation example, with reference to the accompanying drawings wherein :

- Fig. 1 shows an example of a 2D fracture mesh, FM Fracture Mesh,
- Fig. 2 shows an example of a 2D matrix block, MB Matrix Block,
- Fig. 3 shows an imposed flow rate variation curve $F(t)$ in a well test,
- Fig. 4 shows an example of a fracture network for which the method according to the invention leads to a substantial reduction in the number of meshes to be processed, and
- Figs. 5 and 6 illustrate flow charts of the method of the present invention.
- Figs 7 and 8 illustrate the input data as described in the Assignee's U.S. Patent 6,023,656.

Please replace paragraph [0041] as follows:

[0041] Apart from the pressures, the terms of this equation are known. The pore volumes of the fracture meshes and of the matrix blocks (ϕ_i) are known by means of the mesh pattern, the fracture-fracture and matrix-fracture transmissivities (T_{ij}) are calculated as described above and flow rates (Q_i) are zero everywhere except at the well-reservoir connections where they are imposed. ~~The mesh pattern is known using the method described in the above-cited US patent 6,023,656. Fracture lengths and openings (widths) are given by the characteristics of the fracture network and are input data.~~ The pore volume in a given fracture mesh is determined from a volumetric calculation using the length dimensions of fractures within the mesh and the corresponding opening of the fracture.

Please replace paragraph [0057] as follows:

[0057] The geometry of the fracture network and the attributes of the fractures (conductivity, opening) are given in the form of a file as in the method described in the aforementioned US patent 6,023,656.

[0057a] As shown on FIGS. 7 and 8 fractures are assumed to be substantially vertical (i.e. perpendicular to the layer limits). However, a same data structure can be applied to fractures slightly deviating from the vertical direction. The 3D image is discretized vertically complying with the actual geological layering if such information is available. If not, any arbitrary discretization is applied to the image. Each horizontal layer L is characterized by its vertical coordinate z_L in the reference system of coordinates (OX, OY, OZ).

[0057b] For each layer L, a series of rectangles R has lobe defined. Each rectangle consists in a fracture plane element comprised between the limits of a given layer. Hence, each natural fracture consists in a set of superimposed rectangles R and is assigned an origin (fracture origin). Each rectangle is defined by:

the three coordinates (xC, yO, zO) of the rectangle origin (). For a given natural fracture, all the origin points of the constitutive rectangles are situated on the same vertical (or highest dip) line drawn from the fracture origin;

the co-ordinates of the horizontal unit vector i (xH, yH) and of the vertical unit vector j (xV, yV) defining the orientation of the rectangle in the reference system of co-ordinates, with x Vertical and y Vertical being zero in case of vertical fractures but considered as input data to be able to deal with non-vertical fractures;

the two algebraic horizontal lengths 1- and 1+ separating the origin of the rectangle and the two lateral (vertical) limits of this rectangle;

the height h of the rectangle, that is the length of the rectangle along direction j which is the layer thickness if discretization along direction j fits the geology;

the hydraulic conductivity c derived from the application of Darcy's law to fracture flow (for a pressure gradient

$$\frac{\Delta P}{l}$$

the flow rate in the fracture with a height h is

$$\frac{ch}{\mu} \cdot \frac{\Delta P}{l}$$

μ being the fluid viscosity). The conductivity c is given by the relation $c=k \cdot a$ where $k=a^2/12$ (using Poiseuille's Idealized representation of fractures) is the intrinsic permeability of the fracture and a its equivalent hydraulic aperture a. The hydraulic conductivity c is a reference value given for a direction of the maximum horizontal stress parallel to the fracture direction;

the two upper and lower neighboring rectangles UR, LR;

the fracture set to which the rectangle considered belongs to;

the orientation angle α_0 of the direction of maximum horizontal stress taken from (OX) axis in the reference system of coordinates;

for each fracture set, a correlation table correlating 1) the angle between the direction of maximum horizontal stress and fracture direction (azimuth) with 2) the hydraulic conductivity c or equivalent hydraulic aperture a previously defined. "Horizontal" and "vertical" stand in the context for directions respectively parallel and perpendicular to the limits of layers which here are assumed horizontal. Layer limits discretize fracture planes in the "vertical" direction. It must be pointed out that the aforesaid input data 1) are suitable for all the existing software tools used for characterizing and generating fracture and 2) could be used to discretize a network of slightly non-vertical fractures, i.e. not perpendicular to layer limits;